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Which linguistic measures distinguish transient from persistent language problems in Late Talkers from 2 to 4 years? A study on Italian speaking children

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ABSTRACT

Background: In spite of the large literature on Late Talkers (LTs) it's still unclear which factors predict outcome in children younger than 3 years old.
Aims: To identify the early language characteristics of LTs whose outcome was either a transient delay or a Developmental Language Disorder (DLD).
Methods and procedures: 50 LTs were assessed both by indirect and direct measures of expressive and receptive language at three time points between 2 and 4 years of age.
Outcomes and results: At the first evaluation, all LTs had an expressive language delay; 61% also had delayed early syntactic comprehension.

Three different linguistic outcomes emerged: children who caught up with their peers ("Late Bloomers") at age 3; children with slow language recovery ("Slow Learners") at age 4 and children at risk of DLD.

The linguistic measures that differentiated the groups changed with age. By 28 months, impaired syntactic comprehension differentiated children at risk of DLD at 4 years of age, from the other two groups. By 36 months, the discrepancy between vocabulary size and age was larger in children with persistent language difficulties compared to both "Late Bloomers" and "Slow Learners". Expressive grammar differentiated the groups significantly by age 3 with difficulties in this domain still persisting in children with DLD at age 4.
Conclusions: An early syntactic comprehension delay was a predictive index of DLD in LTs, suggesting the importance of evaluating this language component when assessing LT toddlers.
Implications: LTs with receptive-expressive language delay around 24–30 months could benefit from an early language intervention.

What this paper adds?

This study provides data based on late-talking children's early language evaluation which includes not only vocabulary measures, but also direct assessment of expressive and receptive grammar; the latter has not been investigated before with a standardized test in Italian Late Talkers.

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- It replicates the results of other researches and sheds further light on early predictors of language outcome. It shows that late talking children with delayed syntactic comprehension are at high risk of later language difficulties.
- It also confirms that late talking toddlers do not constitute a homogeneous group either in terms of degree of early expressive vocabulary delay or of associated receptive difficulties. Different developmental trajectories have been identified that are predicted by different early linguistic profiles.
- It provides clinicians with diagnostic criteria for selecting children who may benefit from early intervention through identification of different developmental paths.

1. Introduction

Early language delay is a frequent reason of clinical consultation that, according to different epidemiological studies, occurs in about 10%–15% of toddlers (Collisson et al., 2016; Horwitz et al., 2003; Korpilahti, Kaljonen, & Jansson-Verkasalo, 2016; Zubrick, Taylor, Rice, & Slegers, 2007).

Slow language growth may involve primarily the language domain (Bishop, Price, Dale, & Plomin, 2003; Rescorla, 2011) or be the 'surface' manifestation of different neurodevelopmental disorders affecting general motor, cognitive and socio-emotional domains (Paul & Roth, 2011). Children with an early isolated language delay have been called Late Talkers (Rescorla, 2011; Thal & Bates, 1988; Thal, Bates, Goodman, & Jahn-Samilo, 1997). This term doesn't apply to children with early language delay secondary to neurological disorders, intellectual disability, hearing loss, or socio-emotional problems such as autism spectrum disorders (Buschmann et al., 2008; Rescorla & Lee, 2000; Silva, 1980; Whitehurst & Fischel, 1994). Therefore, early language delay warrants a careful diagnostic investigation in order to exclude the presence of other associated neurodevelopmental disorders.

According to the literature, criteria for identifying late talkers (LTs) are a parent-reported expressive vocabulary score at or below the 10th centile and/or no multiword combinations at 30 months (on the MacArthur Communicative Development Inventories, CDIs, Fenson et al., 1993; later renamed MacArthur-Bates CDIs, Fenson et al., 2007), or fewer than 50 words or no word combinations on the Language Development Survey at 24 months (LDS, Rescorla, 1989; Paul, 1991).

Early language delay and its outcome has been the focus of research by several investigators in the past 30 years. Follow-up studies have found that a high percentage of toddlers with delayed onset of language catch up with their peers by 3 or 4 years of age (Bishop & Edmundson, 1987; Bishop et al., 2012; Dale, Price, Bishop, & Plomin, 2003; Paul & Roth, 2011; Paul, 1993; Rescorla & Schwartz, 1990; Rescorla, Dahlsgaard, & Roberts, 2000; Rice, Taylor, & Zubrick, 2008; Sylvestre, Desmarais, Meyer, Bairati, & Leblond, 2017); these children are called "Late Bloomers" (Thal, Tobias, & Morrison, 1991; Thal & Tobias, 1992). However, protracted language problems have been documented in about one third of LTs by several authors (Paul & Roth, 2011; Paul, 2000; Rescorla, 2002; Rice et al., 2008; Thal & Katich, 1996; Whitehurst, Fishel, Arnold, & Lonigan, 1992) and also poor reading and writing skills at school age (Paul, Murray, Clancy, & Andrews, 1997; Rescorla, 2002, 2005, 2009, 2013). Moreover, it has been shown that even LTs that apparently recover the language delay may have lower language abilities than their typically developing peers (TDs) when entering elementary school (Rescorla & Turner, 2015). Residual language problems were reported also by Rice et al. (2008) who found that at 7 years of age, 20% of LTs presented with non-adequate morpho-syntactic skills.

In spite of the large literature on early language delay, it is however still unclear which factors may better predict outcome in children younger than 3 years (Sylvestre et al., 2017), also because late talking toddlers do not constitute a homogeneous group (Desmarais, Sylvestre, Meyer, Bairati, & Rouleau, 2010; Desmarais, Sylvestre, Meyer, Bairati, & Rouleau, 2008) either in terms of degree of early expressive vocabulary delay or of associated receptive difficulties.

Fischel, Whitehurst, Caulfield, and De Baryshe (1989), Rescorla and Schwartz (1990), Rescorla et al. (2000) and Rescorla (2011, 2013) underscored the importance of the severity of expressive vocabulary delay at intake as a predictor of persistent difficulties.

For what concerns receptive abilities, the role of early language comprehension in predicting later language outcome has received a growing attention, as recently reported in a volume exhaustively addressing the main theoretical and clinical issues on late talkers (Rescorla & Dale, 2013). The available data drawn from receptive language testing (Bishop et al., 2012; Carson, Klee, Perry, Donaghy, & Muskina, 1997; Chilosi, Cipriani, Pfanner, Pecini, & Fapore, 2006; Irwin, Carter, & Briggs-Gowan, 2002; Paul & Ellis Weismer, 2013; Paul, 1991; Rescorla & Alley, 2001; Thal et al., 1991) showed that a significant proportion of children with expressive vocabulary delay at 2 years presented with receptive language delay (Desmarais et al., 2008). Several studies have also shown that early gestural communication and receptive language (Paul & Ellis Weismer, 2013; Paul & Roth, 2011; Thal & Katich, 1996; Thal et al., 1991; Thal, Marchman, & Tomblin, 2013) may have a significant predictive value within the preschool age.

More recently, processing skills such as speed of recognizing words, as early as 18 months, have been found to discriminate toddlers with transient language delay from those at risk of persistent difficulties (Marchman & Fernald, 2013).

However, the predictive role of early comprehension remains an important field for further research (Desmarais et al., 2010; Sylvestre et al., 2017), and it requires the use of appropriate tools to study emerging receptive skills in children before age three.

Probably the fact that several studies were carried out on general populations and took into consideration mainly children with expressive language delay (ELD), may explain why the prevalence of LTs with persistent language problems has been underestimated (Bishop et al., 2012; Leonard, 2014; Rudolph & Leonard, 2016). This could, at least in part, explain why the percentage of LTs ending up with Specific Language Impairment (SLI) around five years of age is, according to some authors (i.e. Leonard, 2013; Tager-Flusberg, 2016), lower than the prevalence of SLI in the general population.

In this study we addressed the following questions which are still open and are crucial for the clinical management of LTs:

- How can we identify the early emergence of persistent language impairment?

- Does the study of early syntactic comprehension in Italian LTs confirm its role as a major risk factor of persistent language impairment?
- Does the predictive value of linguistic measures change with age and stage of language acquisition, as reported in other studies?

The aim of our prospective study was to provide some diagnostic guidelines based on LTs early linguistic profiles and developmental language trajectories. With this aim, a group of LTs was tested with both indirect and direct procedures at three time points from about 27 to 48 months of age, evaluating not only lexical but also receptive and expressive grammar skills.

2. Materials and methods

2.1. Subjects

Subjects were selected from a large population of children referred to the Department of Developmental Neuroscience of the Stella Maris Scientific Institute for language delay, according to the following criteria:

- To be between the age of 18 and 34 months;
- To have Italian as the native and only language used in everyday life; an expressive vocabulary, evaluated with the Italian version of the MacArthur–Bates Communicative Development Inventories (Fenson et al., 2007, 'Il Primo Vocabolario del Bambino', PVB, Caselli & Casadio, 1995; Caselli, Pasqualetti, & Stefanini, 2007), at or below the 10th centile and/or absence of combinatorial language at 30 months;
- Absence of auditory, neurological and socio-emotional disorders, and no psychomotor delay; normal developmental history, as reported by parents participating in a semi-structured anamnestic interview with a child neuropsychiatrist at the first evaluation;
- Non-verbal IQ in the normal range (mean IQ of our sample = 99, SD = 9.4) at the Leiter-r Scale (Roid & Miller, 1997);
- Language assessment with at least two evaluations between the second and the fourth year of age (see Table 1).

On the basis of the above criteria, we selected 50 children (37 boys and 13 girls) with a mean age of 27.7 months (SD = 3.7) at the first observation (T1). At T2, 48 children were re-evaluated; 36 of them who were still delayed at T2 (plus two who missed T2) were seen again at T3. Twelve children from the original sample did not participate in the T3 session as, having rapidly resolved the language delay at T2, their parents decided to avoid further clinical evaluations.

2.2. Linguistic assessment

Language evaluation was done through a combination of indirect (parental report) and direct procedures.

Expressive vocabulary was tested by means of the Italian version of the MacArthur-Bates Infant and Toddler Communication Development Inventories (PVB, Caselli & Casadio, 1995; Caselli et al., 2007) which cover the age period from 8 to 30 months. For children markedly delayed in language development well past the age range normally covered by the PVB, assignment of scores was based on language level rather than on chronological age. The analyses presented here are based on raw scores for total words and on lexical quotient (LQ), corresponding to the ratio between lexical age (assigned by determining the age at which a particular score corresponds to the median in the normative sample) and chronological age. This procedure allows evaluating the gap between vocabulary size and chronological age, also in children aged beyond the age range covered by the PVB normative data.

Expressive grammar was evaluated by analyzing language samples collected in our laboratory during a standardized play situation involving the child and his/her parents. Speech was transcribed independently by one of the Authors (L.P.) and by a trained research assistant (inter observer agreement reached 90 per cent). The level of grammatical development was defined according to a six-level rating system (Grid for the Analysis of Spontaneous Speech - GASS) developed by Cipriani, Chilosi, Bottari, and Pfanner (1993). The grid provides a description of the main stages of language acquisition, between level 0 (prelinguistic stage) and level 5 (complex grammar). Stage assignment is based on quantitative measures, such as distribution of different categories of syntactic structures (juxtaposed words, verbless and grammatically simple and complex sentences) and percentages of omitted or erroneous free morphemes (copulas, clitic pronouns, auxiliaries, and prepositions) in the obligatory contexts. According to the GASS, level 0 corresponds to a prelinguistic stage (8–12 months), as spontaneous language production is limited to babble, sounds, and sporadic single words, while at level 1 (holophrastic stage, 12–18 months), single word utterances begin to be used consistently. Level 2 (18–24 months) corresponds to the emergence of combinatorial speech, but single word utterances clearly prevail. At level 3 (24–28 months) multiword utterances are far more common, though many grammatical rules are still missing. The following two levels mark the transition from ungrammatical or telegraphic speech to the emergence of grammar, because in the typically developing children

Table 1
Sample description.

Subjects	Age T1	Age T2	Age T3	Gender		Familiarity		PIQ
Number	Mean (SD)	Mean (SD)	Mean (SD)	Male	Female	% Positive	% Negative	Mean (SD)
50	27.7 (3.7)	37.6 (3.3)	47.7 (4.2)	37	13	78	22	99 (9.4)

(TD) they lead to a complete control of complex grammar between 28 and 36 months. At level 4 children are able to control the basic rules of the main clause, and at level 5 their competencies extend over many types of complex sentences.

Syntactic comprehension was examined with an acting out test that includes 56 items of increasing complexity, consisting of verbal commands that the child is required to act out with a set of toys and familiar objects. Complexity varies with respect to sentence length (from one to two and three words), semantic complexity (predictable *vs*. unpredictable), and agency (child *vs*. object agent of the action). It also includes reversible and locative sentences. Individual z-scores were obtained on the basis of Italian norms available for children aged from 16 to 36 months (COVER, Chilosi, Cipriani, Villani, & Pfanner, 2003; Chilosi, Cipriani, & Pfanner, 2018).

At T3 the level of spontaneous language organization was taken as the language outcome measure. According to the GASS rating system, a level below 4 was indicative of grammatical delay.

2.2.1. Statistical analysis

2.2.1.1. Descriptive statistics. As GASS level was measured on an ordinal scale, median and inter-quartile differences were used as indexes of central tendency; for all the other linguistic measures, mean and standard deviation were calculated. The frequencies of the scores falling in a borderline (below 1 SD from the mean) or deficient range (below 1.5 or 2 SD from the mean or below the 10° percentile) were calculated for all measures according to a different cut-off.

2.2.1.2. Inferential statistics. Non-parametric analysis (Mann-Whitney and Kruskal-Wallis) and univariate Anova with post-hoc comparisons for multiple comparisons (LSD) were used to compare, on GASS level and on the other linguistic measures, the groups showing different developmental trends at the follow-up.

Discriminant analysis (stepwise method) was run to identify the linguistic measures that could significantly predict different outcomes at the follow-up.

Chi-square test was used to verify whether the groups with different outcomes differed also for the distribution of nominal variables such as sex and family risk for language or learning delay.

3. Results

3.1. First observation (T1)

At the mean age of 27.7 months (SD = 3.7, range = 18–34) expressive vocabulary and grammar were delayed in all children.

3.1.1. Expressive vocabulary

The mean number of words produced by the whole sample at T1 was 55.4, with a high inter-individual variability (SD = 59.4). The above value corresponds to a mean age equivalent score of about 18–19 months, reflecting an average delay of about 10 months. The mean lexical quotient (LQ) was 63.7 (SD = 11.4).

3.1.2. Expressive grammar

The median expressive grammar level was 1.14 (SD = 0.5). None of the children scored in the normal range for his/her age, showing a variable degree of delay: 84% had a very primitive language organization (preverbal or holophrastic speech), and 16% started combining words, though their expressive vocabulary was below the 10th percentile for age.

3.1.3. Verbal comprehension

The whole sample mean receptive z-scores was –1.4 (SD = 11.6) with 39% of the sample showing normal and 61% delayed verbal comprehension skills. The delay was moderate in 33% (1 SD below the mean) and severe in 28% (more than 2 SD below the mean).

3.2. Linguistic follow-up (T2)

At the second observation (T2) the mean age of children was 37.5 (SD = 3.3). Two children missed the T2 session and were evaluated at T3.

Twelve out of 48 children (24%) showed a rapid language growth with a spurt in both vocabulary and grammar (they will be called Group 1 - G1).Verbal comprehension z-scores were in the normal range and did not change consistently between the two time points (see Table 2).

The remaining thirty-six children were still delayed in both expressive vocabulary and grammar, though all language scores improved from T1 to T2.

In order to evaluate the course of language development, the children still delayed at T2 were assessed again at a mean age of 47.7 months (T3). At this age, 11 out of 38 children (who will be called Group 2 - G2) attained a normal grammar level (GASS level median = 4.5, interquartile range = 0), whereas 27 (who will be called Group 3 - G3) had persistent grammar difficulties (GASS level median = 3.5, interquartile range = 1). The difference between the two groups was statistically significant (Mann Whitney, U = 19, $p < 0.001$).

Table 2
Language scores and age of the three Groups at T1, T2 and T3.

Time of evaluation	T1			T2			T3	
Group	Group 1 (N = 12) Mean (SD)	Group 2 (N = 11) Mean (SD)	Group 3 (N = 27) Mean (SD)	Group 1 (N = 12) Mean (SD)	Group 2 (N = 9) Mean (SD)	Group 3 (N = 27) Mean (SD)	Group 2 (N = 11) Mean (SD)	Group 3 (N = 27) Mean (SD)
Age (in months)	25.5 (3.3)	27.4 (3.8)	28.3 (3.9)	35.2 (2.8)	38.5 (3.4)	38.4 (3.07)	45.6 (3.6)	48.6 (4.1)
Vocabulary size (number of words)	102.9 (79)[a]	61.9 (67.5)	31.6 (24)[a]	506.5 (110.4) [a]	373 (208)	248.8 (153.4) [a]	–	–
Lexical quotient	76.1 (6.8) [a]	62.9 (10.9) [a]	58.5 (8.9)	91 (11.9) [a]	77.2 (11.1) [a]	63.6 (11.4) [a]	–	–
Verbal comprehension (z score)	−0.2 (0.8) [a]	−0,7 (0.5) [a]	−2,2 (1.7) [a]	−0.2 (0.4)	−0.61 (1.2)	−0.82 (1.4)	–	–
Expressive grammar (GASS level)	Median = 1.25; (0.9[a])	Median = 1.25; (1)	Median = 1; (0)	Median = 4,5; (0,9[b])	Median = 3; (0.9[a,b])	Median = 2.5; (1[b])	Median = 4.5; [a] (0.00[b])	Median = 3.5; [a] (1[b])

[a] Main group effect.
[b] Interquartile range.

3.2.1. Comparisons across groups at different times of development

On the basis of the above developmental patterns statistical comparisons were conducted to test which of the T1 linguistic measures could differentiate the three groups (G1, G2 and G3). Analyses of variance conducted on chronological age at T1 showed no significant differences among groups ($F = 2.47$, $p = 1.01$), while a significant effect of group was found on the following linguistic measures: number of words ($F = 7.7$, $p < 0.001$); lexical quotient ($F = 15.4$, $p < 0.005$) and sentence comprehension ($F = 11.4$, $p < 0.001$). Anova and post-hoc comparisons (LSD) showed significantly higher verbal comprehension z- scores in G1 and G2 compared to G3 ($p < 0.001$), and a higher number of words in G1 compared to G3 ($p < 0.001$). However, when considering lexical quotient (LQ), that is, the gap relative to chronological age, also G2 had a significantly lower LQ than G1 ($p < 0.001$). The three groups did not differ in expressive grammar ($\chi 2\ (2) = 5.31$, $p = 0.07$).

At T2, Anova showed a significant group effect for number of words ($F = 11.9$, $p < 0.000$) and lexical quotient ($F = 23.2$, $p < 0.001$). Post hoc tests with LSD correction indicated that number of words differed between G1 and G3 significantly ($p < 0.001$), and lexical quotient was significantly higher in G1 vs G2 and in G1 vs G3 (respectively $p < 0.005$, $p < 0.001$) and in G2 vs G3 ($p < 0.05$).

Verbal comprehension no longer differed between the three groups ($p = 0.23$), though looking at individual z-scores, 25% of children from G3 showed a comprehension deficit (z-score below -1.5).

The expressive grammar differentiated the three groups significantly (GASS level; $\chi^2 = 19.8$, $p < 0.001$). Separate comparisons between G1 and G2, G1 and G3, G2 and G3 were all significant (respectively $z = -2.84$, $p < 0.005$; $z = -4.03$, $p < 0.001$; $z = -2.14$, $p < 0.05$).

At T3, comparison of grammar level was conducted only between G2 and G3. The difference was statistically significant ($z = -4.26$, $p < 0.001$) for a higher GASS level in G2.

3.2.2. Discriminant function analysis

We next tested the predictive value of T1 measures by a discriminant function analysis (stepwise method) with Expressive Vocabulary, Verbal Comprehension z-scores and GASS level as independent variables and outcome groups (G1, G2 and G3) as grouping variables. Verbal comprehension significantly predicted G1 and G3 outcome (Wilxs lambda = 0.67, X2 = 18.37, $p < .0001$) as 91.7% of children from G1 and 92.6% from G3 were correctly classified. Conversely, according to discriminant analysis, verbal comprehension did not identify children from G2, assigning four children to G1 and seven children to G3 (with z-scores between -1.54 and -0.72).

In order to further analyze possible predictors of G2 outcome at T1, two separate discriminant analyses, the first on G1 and G2, and the second on G2 and G3, were performed. When discriminant analysis was conducted on G1 and G2, expressive vocabulary sorted out as a significant predictor (Wilxs lambda = 0.8, X2 = 3.9; $p < .05$) with 75% of correct predictions of children from G1 and 45.5% of children from G2. When discriminant analysis was conducted on G2 and G3, verbal comprehension sorted out as a significant predictor (Wilxs lambda = 0.81, X2 = 7.4, $p < .01$) of G3 (92.6%), but not of G2 (27.3%).

At T2, lexical quotient and GASS level sorted out as significant predictors (Wilxs lambda = 0.35, X2 = 29.4, $p < .001$) of G1 (81.8%) and G3 (92%), but not of G2 (20%).Verbal comprehension no more did sort out as a discriminant variable.

At T3 the GASS level correctly classified 92% of G2, and 89% of G3 (Wilxs lambda = 0.62, X2 = 16.9, $p < .001$).

3.2.3. Association between family history and language outcome

Data on familial antecedents of oral and written language problems were available for 41 cases.

The analysis of the distribution of positive/negative cases within the three groups showed that 76% of children from G3 vs 40% of children from G1 and G2 had a positive family history, the difference falling short of statistical significance ($X^2 = 5.64$, $p = .056$).

The mean sex ratio was 2.8:1, with a prevalence of males over females. Sex distribution differed between the three groups (G1 = 5:1; G2 = 1.2:1; G3 = 3.5:1), but the differences were not statistically significant.

4. Discussion

The main aim of the present study was to identify the early language characteristics of late talkers whose outcome was either a Developmental Language Disorder (DLD, Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE consortium, 2016; Bishop, Snowling, Thompson, Greenhalgh, & the CATALISE-2 consortium, 2017) or a transient delay. With this aim, a group of LTs was prospectively followed and assessed both by questionnaires (completed by parents) and by direct measures of expressive and receptive language at three time points between 2 and 4 years. As the primary objective of this study was to look for early language predictors of unfavorable outcome, children with receptive language delay were included in the sample, given the fundamental role of verbal comprehension in language acquisition. The high risk of poor language outcome in late talking toddlers with delayed comprehension at age 2 was recently confirmed by Paul and Ellis Weismer (2013) and Thal et al. (2013). However, due to the difficulty of testing receptive language abilities in toddlers and the scarcity of standardized instruments for children below age three, studies of LTs directly assessing early syntactic comprehension are few (Bishop et al., 2012; Buschmann et al., 2008; Desmarais et al., 2008, 2010; Sylvestre et al., 2017).

In the current study, we used an acting out test that taps early syntactic comprehension. It has been standardized on TD Italian children aged from 16 to 36 months (Chilosi et al., 2018), and also applied to the study of children with different neurodevelopmental disorders (2013, Chilosi et al., 2005).

When first assessed, at a mean age of 28 months, all children showed a variable degree of delay in expressive vocabulary and

grammar and about 60% were also delayed in syntactic comprehension.

At the short-term follow-up (mean age 37.5 months), around one quarter of the total sample attained age appropriate receptive and expressive language skills; whereas the remaining subjects were still delayed in expressive vocabulary and grammar, producing combinatorial or telegraphic utterances with no access to grammaticization. By the final assessment at age 4, around 30% of this latter group attained an average expressive grammar level. Therefore, considering the total initial sample, 46% of cases showed persistent expressive grammar difficulties suggestive of a possible DLD, even if some of them might improve after age 4. In fact, as reported by Rescorla (2011, 2013), several studies indicate that by age 5 many LTs catch up in grammatical skills, although they could still show weaknesses in the control of complex grammar compared to typically developing peers.

The higher percentage of 4 years old children with persistent language delay found in the present study, compared to others, probably reflects the fact that our sample was recruited from a clinical population and included not only children with pure expressive delay, but also children with receptive-expressive delay.

4.1. Developmental trajectories and early predictors of language outcome

The results of the present study highlight three developmental language trajectories, which are related to different early linguistic profiles.

The first trajectory appeared to be characterized by an initial mild delay in lexical and grammar development, with normal comprehension. It was followed – after a slow start – by acceleration of the rate of development and catch-up in language acquisition within the third year of life. These children seem to correspond to the so-called “Late Bloomers”, or transiently language delayed children.

The second trajectory was characterized by early language delay, mainly restricted to the expressive domain but still persisting past age three, with substantially good early verbal comprehension. These children might be defined “Slow Learners”, because of the slow pace of development but a good outcome, with language recovery around 4 years of age.

The third trajectory included children with an initial linguistic profile characterized by a widespread language delay affecting early syntactic comprehension and by a more severe lexical and grammar delay compared to the other two groups. These children’s outcome was a developmental language disorder and all received language intervention by a speech-language therapist.

The linguistic measures that differentiated the three groups changed with age and stage of language acquisition. These findings are in agreement with previous studies by Rescorla (2011, 2013), showing that the pattern of linguistic difficulties has “a developmental progression over time” since “delays become evident in a newly emerging domain of language functioning” (Rescorla & Dale, 2013, p. 383).

When considering receptive language, by 28 months, impaired syntactic comprehension differentiated children with a poor outcome from both “Late Bloomers” and “Slow Learners”.

This data confirms and strengthens the results of other studies on the predictive value of receptive abilities in the earlier stages of development (i.e. Dale & Hayiou-Thomas, 2013; Paul & Ellis Weismer, 2013; Rescorla, 2013; Thal et al., 2013). The latter author reported that LTs with a lexical comprehension delay at 16 months, produced significantly fewer complex sentences at 28 and 36 months in comparison to TD and ELD children.

By age 3, early syntactic comprehension no more differentiated the three groups. Nevertheless, in our sample some children among those with persistent language deficits still had impaired receptive skills, suggesting a continuing weakness of language decoding abilities in children who will maintain a grammar impairment at the final assessment.

When considering lexical measures, a greater early discrepancy between chronological age and vocabulary size (lexical quotient) differentiated “Slow Learners” and children with DLD from “Late Bloomers” at T1. This finding is in line with the reports by Rescorla and Schwartz (1990), Rescorla, Roberts, and Dahlsgaard (1997), Rescorla et al. (2000) and Rescorla (2013) confirming that the expressive vocabulary lag at intake is a significant predictor of outcome in children with pure expressive language delay.

By age 3, “Late Bloomers” still had significantly better vocabulary scores than the other two groups; at this age, vocabulary measures also differentiated “Slow Learners” from children with persistent language impairment. In addition, at this stage, grammar emerged as a linguistic measure that marked the three different developmental language trajectories significantly. In particular, while the “Late Bloomers” attained an age appropriate level of expressive grammar, the “Slow Learners” lagged behind but performed significantly better than children at risk of DLD.

The latter results confirm the continuity between lexicon and grammar both in typical and atypical language acquisition (Bates & Goodman, 1997; Thal et al., 2013), and point to the importance of evaluating grammatical abilities at 3 years of age in children who are at risk of later language impairment (Sylvestre et al., 2017). These findings are also consistent with Dale and Hayiou-Thomas (2013) assumption that long term outcome may be better predicted by expressive language measures at 3 than at 2 years of age.

By age 4, the “Slow Learners” achieved, as a group, normal grammar abilities with substantial control of free morphology and of the basic rules of simple and complex sentences, differently from children with unfavorable outcome, who still produced a high percentage of morphologically incomplete sentences with omission of many free and bound morphemes in most of the obligatory contexts.

The above results were supported by the discriminant function analysis showing that sentence comprehension at T1 was the best early predictor of language outcome, correctly identifying at single subject level most of “Late Bloomers” and of those at risk of DLD.

Early prediction of the “Slow Learners” language outcome was more problematic. Most of them (90%) were correctly classified at the single subject level only at age 4, on the basis of the expressive grammar level.

The heterogeneity of behavioral profiles and the continuity of the individual differences observed in our sample are not

supportive of a categorical characterization of LTs, based on sets of static diagnostic criteria. Our sample showed a spectrum of language difficulties with quantitative differences among groups and different developmental language trajectories compatible with a dimensional approach. Some LTs, rapidly overcoming their delay (late bloomers), showed a less severe language delay and normal comprehension. Other children presented with a more severe receptive- expressive language delay as a sign of continuity between late talking and DLD. Moreover, a categorical approach could not explain the developmental trajectories of the "slow learners", who differ quantitatively from late bloomers in early vocabulary and from children at risk of DLD in early sentence comprehension. At a theoretical level, these data provide further support to the hypothesis that LTs and children with DLD do not belong to distinct categories, but are best conceptualized according to a dimensional view of language development and disorders (Bates, Dale, & Thal, 1995; Ellis Weismer et al., 2000; Ellis Weismer, 2007; Rescorla, 2009; Thal et al., 2013). Rescorla (2009) have provided a stronger support to the dimensional approach with a protracted follow-up study. According to the Authors, quantitative differences among DLD, LTs and typically developing peers, persist along a continuum of language abilities from 2 to 17 years of age, with LTs manifesting weaker language- related skills up to adolescence compared to TDs.

Finally, from a clinical point of view, our findings suggest that in children with expressive language delay persisting past age 3, a careful clinical monitoring of the developmental pace is warranted to appropriately select children who might benefit from an early language intervention. As recently pointed out by some authors the level of grammar abilities assumes an increasing prognostic value, given that vocabulary delays often resolve by age 3, whereas grammatical delays may be more enduring (Rescorla & Dale, 2013; Leonard, 2013; Sylvestre et al., 2017).

4.2. Limitations

The findings of our study should be interpreted in the light of some methodological limitations. One first limitation refers to the lack of a comprehensive analysis of the impact of nonlinguistic risk factors on language outcome. In fact, our analysis was limited to familiarity and gender, and did not take into consideration environmental variables which have been shown to play an important role in the LTs language outcome (Bishop et al., 2012; Collisson et al., 2016; Korpilahti et al., 2016; Marini, Ruffino, Sali, & Molteni, 2017). In particular, we could not obtain measures of social status which, according to the Victoria study (Reilly et al., 2010), could partially influence language outcome, with social disadvantage becoming increasingly important during the preschool years. In accordance with several small- and large- scale studies, we found a prevalence of males over females and the presence of familial antecedents for oral and/or written language problems, especially in children at risk of DLD.

A further limitation might be represented by the use of the grammar organization level as the only outcome measure at age 4. This choice was motivated by the fact that a sample of spontaneous language production was available for all children at the different points of follow-up, while other grammar measures were not homogeneous across ages. Moreover, the analysis of spontaneous language production performed and coded according to the GASS, has proven an ecologic and clinically useful tool to measure the level of mastery of grammar in Italian, a language with a rich and complex morpho-syntax (Chilosi et al., 2005, 2013; Cipriani et al., 1993). We are aware that complex morpho-syntax deserves further investigation being a specific area of vulnerability in LTs, that may persist past 5 years of age (Rescorla & Turner, 2015; Rice et al., 2008). In addition, grammar deficits have been identified as markers of specific language impairment in several studies on developmental language disorders also including Italian speaking children (Bortolini et al., 2006; Leonard, Deevy, Fey, & Bredin-Oja, 2013; Rice & Wexler, 1996; Rice, Wexler, & Redmond, 1999; Rice, Levy, & Schaeffer, 2003).

A final limitation is related to the fact that Late Bloomers were not reevaluated past age 3, and this does not allow verification of the stability of their language status at a later age.

5. Conclusion

Our study confirms and strengthens the conclusions drawn from previous researches (Rescorla & Dale, 2013) arguing that careful expressive and receptive language assessment with a combination of indirect and direct age appropriate procedures is needed to early identify late talking children at high risk of persisting language difficulties. According to our data and in line with the literature, children (in particular boys with familial antecedents of language problems), who present with an early receptive-expressive language delay and severe vocabulary lag around 24–30 months, should be enrolled in early intervention services. Language treatment should primarily focus on the development of verbal comprehension and facilitate the acquisition of expressive combinatorial skills (Cipriani et al., 2002). As it is well known, early language intervention may provide external support that could act as a protective factor, especially if parents are directly involved in the treatment (Bonifacio, Stefani, & Zocconi, 2005; Girolametto et al., 2002; Girolametto & Weitzman, 2006; Girolametto, Weitzman, & Greenberg, 2006). However, for children with mainly expressive language delay but slow pace of development (Slow Learners), the issue of whether, when and what type of language treatment should be provided is less clear and requires further large scale studies in order to better understand the cognitive, language, and environmental characteristics of these children.

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Conflicts of interest

The authors have declared that no competing interests exist.

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